

**POWER SEMICONDUCTOR DEVICES HAVING Laterally  
EXTENDING BASE SHIELDING REGIONS THAT INHIBIT BASE  
REACH-THROUGH AND SCHOTTKY RECTIFYING FLYBACK DIODES**

Abstract of the Disclosure

A power MOSFET includes a semiconductor substrate having a drift region therein and first and second transition regions of first conductivity type that extend between the drift region and a first surface of the semiconductor substrate. Each of the first and second transition regions has a vertically retrograded first conductivity type doping profile therein that peaks at a first depth relative to the first surface. First and second shielding regions of second conductivity type are provided in the drift region and define respective P-N junctions with the first transition region. The shielding regions extending laterally towards each other in a manner that constricts a neck of the first transition region to a minimum width at a second depth relative to the first surface. An anode electrode is provided. The anode electrode that extends on the first surface of the semiconductor substrate and defines a Schottky rectifying junction with the second transition region.

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